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EXAMINER

FLOURNOY, HORACE L

ART UNIT	PAPER NUMBER
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2189

DATE MAILED: 09/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/783,018

Applicant(s)

MORISHITA ET AL.

Examiner

Horace L. Flournoy

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02/23/2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on _____ is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. 10/783,018.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claims 1-18 are presented for examination.

Priority

Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d). The certified copy has been filed in parent Application No. 2003-418907, filed on 12/17/2003.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 4 and 5 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Particularly the words "until out of data written to said first primary volume" found in both claims 4 and 5 fail to particularly point out what is claimed. Even with the indefinite phrase taken out of the sentence, the claims do not convey a clear meaning to someone of ordinary skill in the art.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 2, 4, 5, 8, and 9 are rejected under 35 U.S.C. 102(e) as being anticipated by Fujibayashi (U.S. Patent no. 6,640,291, hereafter referred to as Fujibayashi).

With respect to the limitation of independent claims 1, 8, and 9

“A remote copy system which copies data between a plurality of storage systems, comprising:

a first storage system comprising a first primary volume; is disclosed in column 8, lines 52, 66-67. Fujibayashi discloses in column 8, line 52 “a first storage system located in a first location;” Fujibayashi discloses in column 8 lines 66-67 “...first storage system and the second storage system are primary storage systems...”

a second storage system comprising a second primary volume; is disclosed in column 8, lines 53, 66-67. Fujibayashi discloses in column 8, line 53, "a second storage system located in the first location..." Fujibayashi discloses in column 8 lines 66-67 "...first storage system and the second storage system are primary storage systems..."

a network apparatus which is coupled to a host computer, is disclosed in column 2, lines 61-65, and column 8 lines 61-65, FIG. 1.

The examiner interprets the limitation "network apparatus which is coupled to a host computer..." as a controller that can be integrated into the storage system (or into each storage system) or implemented as a separate unit from each which is (are) coupled or connected to a host computer (processor).

Fujibayashi discloses in column 2, lines 61-65, FIG.1, "The controller, which directs the operation of the storage system, includes a set of channel interfaces for communicating with the host processor and other storage systems..." FIG. 1 shows a controller in each of the three storage systems, which anticipate the network apparatus of claim 1.

"...said first storage system and said second storage system, and which controls a path for accessing from said host computer to said first primary volume and a path for accessing from said host computer to said second primary volume;" is disclosed in column 2, lines 61-65, and column 8 lines 61-65, FIG.1.

"...and a third storage system which is coupled to said first storage system and said second storage system, and which comprises a secondary volume..." is disclosed in column 8 lines 56-66, column 2, lines 62-65; FIG. 1.

Fujibayashi discloses in column 8, lines 60-62 and column 9 lines 1-3, "a third storage system located in a second location; a remote copy connection coupling the third storage system to a storage system in the first location...the first storage system and the second storage system are primary storage systems, and the third storage system is a secondary storage system designated to back-up the first storage system over the remote copy connection."

"...wherein:

said first storage system stores data received from the host computer into said first primary volume, and sends the data stored in said first primary volume to said third storage system through a network;

said third storage system stores the data received from said first storage system into said secondary volume; and..." is disclosed in column 3, lines 38-40, and lines 14-22.

The examiner interprets both limitations to mean the first storage system stores data received from a host computer and sends the data stored in the first primary volume to a third storage system to be stored in the secondary storage.

Fujibayashi discloses in column 3, lines 38-40, "...a connection 109 (see FIG.1) between host processor 101 and new primary storage system 103 is established." Fujibayashi further discloses that "As used throughout the present disclosure, the term "connection" generally refers to a communications link...A connection can be moved in a variety of ways...to redirect data to a new communications path" (column 3, lines 14-22). Fujibayashi teaches a first

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storage system (new primary storage system) that receives data from the host computer (through the connection between host processor and new primary storage).

Fujibayashi next discloses in column 4, lines 47-49, FIG. 2, "In action 212, a remote copy function between new primary storage system 103 and old secondary storage 104 over connection 107 is started." Fujibayashi teaches data sent (via connection 107) from a first storage system(new primary storage system) to a third storage system (old secondary storage) and stored therein.

"...when the data stored in said first primary volume is migrated to said second primary volume,

said network apparatus transfers an access request issued from the host computer and destined to said first primary volume, to said second primary volume,

said second storage system receives, from said first storage system, management information for identifying data to send to said third storage system,

said second storage system stores write data received from the host computer and the data received from said first storage system and stored in said first primary volume, into said second primary volume, and sends data determined based on said management information out of the data stored in said second primary volume, to said third storage system, and said third storage system stores the data received from said second storage system, into said secondary volume" is disclosed in column 2, lines 61-65, FIG.1.

The examiner interprets these limitations to mean: when the data stored in the first primary volume is migrated to the second primary volume, the network apparatus (controller) transfers an access request from the host computer and destined for the first primary volume, to the second primary volume. Then the second storage system receives management information (remote copy configuration information) from the first storage system and the write data from the host computer and sends the data to the third storage system based off the write data.

Fujibayashi discloses in column 2, lines 61-65, FIG.1, "The controller, which directs the operation of the storage system, includes a set of channel interfaces for communicating with the host processor and other storage systems..." Fujibayashi then teaches in column 3, lines 33-36, "In action 204, the remote copy function between old primary storage system 102 and old secondary storage system 104, as well as communications between old primary storage system 102 and host processor 101 are disrupted." Fujibayashi next discloses in column 8, lines 13-20, "coupling a first storage system to a second storage system, wherein the first storage system is destined to be replaced with the second storage system; migrating remote copy configuration information from the first storage system to the second storage system; coupling the second storage system to a third storage system remotely located from the first storage system." FIG. 1 shows that any data coming from the host computer is transferred to the actual storage unit (or volumes) through the controller. Fujibayashi teaches that the communication (access request) between the old

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primary storage system (second storage system) and host is disrupted and replaced with a new communication line between the new primary storage system and host (column 8, lines 37-41).

With respect to claim 2, "A remote copy system according to Claim 1, wherein: according to an instruction from a management terminal, said network apparatus converts access target identification information included in the access request received from the host computer into identification information of said second primary volume, and sends the converted access request to said second storage system;" is disclosed in column 3, lines 39-44 and column 4, lines 47-49.

The examiner interprets the first limitation of claim 2 to mean, according to an instruction from a management terminal the network apparatus takes target identification information from the host and sends it to the second primary volume.

"...and according to an instruction from said management terminal, said second storage system receives the data stored in said first primary volume from said first storage system and stores the received data to said second primary volume, and sends the data stored in said second primary volume to said third storage system" is disclosed in FIG. 2 and column 3, lines 39-44.

The examiner interprets the second limitation of claim 2 to mean the second primary volume receives data from the first primary storage volume and

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sends it to the third storage system, according to an instruction from the management terminal.

Fujibayashi discloses in FIG. 2 elements 206-214, column 3, lines 39-44, "...a connection 109 (see FIG. 1) between host processor 101 and new primary storage system 103 is established." Next Fujibayashi discloses, "In action 208, remote copy configuration information is migrated from old primary storage system 102 to new primary storage system 103..." (column 3 lines 42-44). Fujibayashi then discloses in column 4, lines 47-49, "In action 212, a remote copy function between new primary storage system 103 and old secondary storage 104 over connection 107 is started." Fujibayashi's teachings, especially that of FIG.2, anticipate both limitations of claim 2.

With respect to claim 4, "A remote copy system according to Claim 1, wherein: until, out of data written to said first primary volume, data to be stored into said secondary volume has been completely transferred, said third storage system receives said data from said first storage system and stores said data into said secondary volume" is disclosed in column 14, lines 64-65.

The examiner interprets this claim to mean the third storage system receives and stores data from the first storage system until the data has been completely transferred.

Fujibayashi discloses in column 6 lines 43-47, FIG. 7, elements 710-714, "Also in action 712, the remote copy function between old primary storage

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system 102 and new secondary storage system 601 is started. In action 714, old secondary storage system 104 is removed after the completion of the online data migration.” Fujibayashi teaches a third storage system (new secondary storage system) receives and stores data (data migration) from a first storage system (old primary storage system) until the data has been completely transferred.

With respect to claim 5, “A remote copy system according to Claim 4, wherein: until, out of data written to said first primary volume, data to be stored into said secondary volume has been completely transferred, said third storage system receives said data from said first storage system to store said data into said secondary volume, and also receives said data which said second storage system is received from the host computer, from said second storage system to store said data into said secondary volume” is disclosed in column 6 lines 43-47, FIG. 7, elements 710-714 and column 5 lines 17-20.

The examiner interprets this claim to mean the third storage system receives and stores data from the first storage system until the data has been completely transferred and also receives data from the host computer.

Fujibayashi discloses in column 6 lines 43-47, FIG. 7, elements 710-714, “Also in action 712, the remote copy function between old primary storage system 102 and new secondary storage system 601 is started. In action 714, old secondary storage system 104 is removed after the completion of the online data migration.” Fujibayashi teaches a third storage system (new secondary storage

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system) receives and stores data (data migration) from a first storage system (old primary storage system) until the data has been completely transferred.

Fujibayashi further discloses that, "In the online data migration setup of FIG.1 and method of FIG.2, the host connection and the remote copy connection are re-routed to the new primary storage system prior to the beginning of the data migration" (column 5 lines 17-20). Since the host computer is connected (FIG.1-2) to a first storage system (new primary storage) it transfers data between it and a third storage system (new secondary storage system).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere CO.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claim 3 is rejected under 35 U.S.C. 103(a) as being obvious over Fujibayashi (U.S. Patent no. 6,640,291) in view of Gupta (US Patent No. 6,779,093 hereafter referred to as Gupta).

With respect to claim 3, Fujibayashi teaches "A remote copy system according to Claim 1..." as stated supra.

Fujibayashi, however, does not disclose expressly "...wherein: the management information, which said second storage system receives from said first storage system, further includes information managing write order of data written by the host computer; and said second storage system uses said information managing write order to manage write order of the write data received from the host computer." (Note: Fujibayashi, as stated previously, does disclose sending management information from a first storage system to a second storage system).

Gupta discloses, "Storage areas in a replicated storage group are under the control of an application, such as application 112A or database 114A of FIG. 1, that requires write-order fidelity among the updates to the storage areas. An application such as application 112A of FIG. 1 manages data in a primary replication storage group, such as RSG 240A." (column 6 lines 40-46, FIG. 1 element 112A).

Fujibayashi and Gupta are analogous art because they are from the same field of endeavor, that being data replication between storage devices.

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At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate a remote copy system of claim 1 in which the management information that is sent from a first storage system to a second storage system further includes a write order management feature to manage write order of the write data received from the host computer to arrive at claim 3.

The motivation for doing so would have been obvious based on the teaching of Gupta in column 6, lines 49-52, "Write ordering is strictly maintained within a replication storage group during replication to ensure that each remote storage area is always consistent, both internally and with all other storage areas of the replication storage group."

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention having the teachings of Fujibayashi and Gupta before him/her to combine Gupta and Fujibayashi for the benefit of having a write order management feature to manage write order of the write data received from the host computer and sent from a first storage system to a second storage system to obtain the invention as specified in claim 3.

Claim 6 is rejected under 35 U.S.C. 103(a) as being obvious over Fujibayashi (U.S. Patent no. 6,640,291) in view of Fellin (US PG Pub No. US 20040078637 A1 hereafter referred to as Fellin).

With respect to claim 6, Fujibayashi teaches "A remote copy system according to Claim 5..." as stated supra.

Fujibayashi, however, does not disclose expressly "...wherein: data received by said third storage system from said first storage system or from said second storage system is given with a sequence number, and said third storage system stores data received from said first storage system or from said second storage system, in order of sequence numbers, into said secondary volume."

(Note: Fujibayashi, as stated previously, does disclose a third storage system that receives and stores data from either a first or second storage system).

Fellin discloses, "Sequence numbers are integers, which are assigned by the source in increasing order, preferably in increments of one without gaps, to read and write requests. Separate consecutive sequences are assigned to read requests and write requests. The assigned sequence number of a write request is sent to each replica, and it is stored by the replica in association with the data item that was modified by the write request. In other words, the sequence number associated with a particular data item is the sequence number of the last write request that modified that data item" (page 2 paragraph [0014]).

Fujibayashi and Fellin are analogous art because they are from the same field of endeavor, that being data replication between storage devices.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate a remote copy system of claim 5 in which the data received by a third storage system from either a first or second storage system is given with a sequence number and stored in the order of that sequence to arrive at claim 6.

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The motivation for doing so would have been obvious based on the teaching of Fellin on page 2 paragraph [0014], "That is why the sequence number associated with the data item is hereinafter referred to as last_modified. The last_modified counter is stored in a non-volatile storage device, which is non-volatile memory in the preferred embodiment, to prevent its loss upon a replica failure."

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention having the teachings of Fujibayashi and Fellin before him/her to combine Fellin and Fujibayashi for the benefit of having data received by a third storage system from either a first or second storage system given with a sequence number and stored in the order of that sequence to obtain the invention as specified in claim 6.

Claim 7 is rejected under 35 U.S.C. 103(a) as being obvious over Fujibayashi (U.S. Patent no. 6,640,291) in view of Fellin (US PG Pub No. US 20040078637 A1 hereafter referred to as Fellin).

With respect to claim 7, Fujibayashi teaches "A remote copy system according to Claim 6..." as stated supra.

Fujibayashi, however, does not disclose expressly "...wherein: said management information, which said second storage system receives from said first storage system, further includes a sequence number whose value is larger by one, than a newest sequence number given to data that said first storage

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system receives from the host computer: and said second storage system gives sequence numbers to write data received from the host computer, with an initial value of said sequence numbers being the sequence number included in the management information received from said first storage system" (Note: Fujibayashi, as stated previously, does disclose sending management information from a first storage system to a second storage system).

Fellin discloses, "Sequence numbers are integers, which are assigned by the source in increasing order, preferably in increments of one without gaps, to read and write requests. Separate consecutive sequences are assigned to read requests and write requests. The assigned sequence number of a write request is sent to each replica, and it is stored by the replica in association with the data item that was modified by the write request. In other words, the sequence number associated with a particular data item is the sequence number of the last write request that modified that data item" (page 2 paragraph [0014]).

Fujibayashi and Fellin are analogous art because they are from the same field of endeavor, that being data replication between storage devices.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate a remote copy system of claim 6 in which the management information received by second storage system from a first storage system is given with a sequence number whose value is larger by one, than the newest sequence number given to data that said first storage system receives from the host computer, and second storage system gives sequence numbers to write data received from the host computer to arrive at claim 7.

The motivation for doing so would have been obvious based on the teaching of Fellin on page 2 paragraph [0014], "That is why the sequence number associated with the data item is hereinafter referred to as last_modified. The last_modified counter is stored in a non-volatile storage device, which is non-volatile memory in the preferred embodiment, to prevent its loss upon a replica failure."

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention having the teachings of Fujibayashi and Fellin before him/her to combine Fellin and Fujibayashi for the benefit management information that is received by second storage system from a first storage system is given with a sequence number whose value is larger by one, than the newest sequence number given to data that said first storage system receives from the host computer, and second storage system gives sequence numbers to write data received from the host computer to obtain the invention as specified in claim 7.

Claims 10-18 are rejected under 35 U.S.C. 103(a) as being obvious over Fujibayashi (U.S. Patent no. 6,640,291) in view of "Structured Computer Organization" 2nd edition, by Tanenbaum (hereafter referred to as Tanenbaum).

With respect to claims 10-18, Fujibayashi does not disclose expressly, "A computer program product for performing remote copying between a plurality of storage systems..."

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Tanenbaum discloses, "*Hardware and software are logically equivalent.* Any operation performed by software can also be built directly into the hardware and any instruction executed by the hardware can also be simulated in software" (page 11).

Fujibayashi and Tanenbaum are analogous art because they are from the same field of endeavor, that being computer architecture.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate the remote copy system of claims 1-9 (hardware) as a computer program product to arrive at claims 10-18.

The motivation for doing so would have been obvious based on the teaching of Tanenbaum on page 11 "*Hardware and software are logically equivalent.* Any operation performed by software can also be built directly into the hardware and any instruction executed by the hardware can also be simulated in software."

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to implement claims 1-9 in software thereby obtaining the inventions as specified in claims 10-18.

Conclusion

Any inquiry concerning this communication or earlier communication from the examiner should be directed to Horace L. Flournoy whose telephone number

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is (571) 272-2705. The examiner can normally be reached on Monday-Friday 7:00 AM to 4:30 PM (ET).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Don Sparks can be reached on (571) 272-4201. The fax phone numbers for the organization where this application or proceeding is assigned is (703) 746-7239

Information regarding the status of an Application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or PUBLIC PAIR. Status information for unpublished applications is available through Private Pair only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

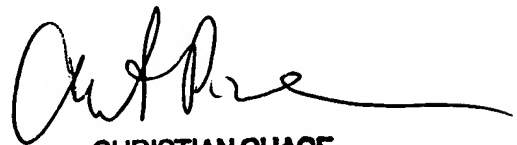
Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (571) 272-2100.

Horace L. Flournoy



Patent Examiner

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**CHRISTIAN CHACE
PRIMARY EXAMINER**

Primary Patent Examiner

Technology Center 2100